

The Canadian Entomologist

LXV

ORILLIA, FEBRUARY, 1933

No. 2

A NEW SPECIES OF MACROCENTRUS FROM NOVA SCOTIA (HYMENOP.)

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Macrocentrus bradleyi n. sp.

Female.—Length 7 mm. Head very little wider than thorax, cheeks, viewed from the side, broader than the temples; face much broader than long, shallowly sparsely punctate; eyes large, prominent; malar space about as long as basal width of mandible; clypeus convex, much less than twice as broad as long, the anterior margin truncate; distance from clypeal foveae to eyes about equal to length of clypeus; lateral ocelli not distinctly larger than median ocellus; longest segment of maxillary palpus distinctly shorter than second segment of antennal flagellum; apical segment of labial palpus much longer than preceding segment; antennae of the type broken, seven segments of flagellum present; first flagellar segment about as long as height of eyes.

Thorax stout, prescutum prominent, descending abruptly anteriorly, shining, impunctate; parapsidal furrows well defined, foveolate, reticulate where they meet; a prominent carina between lateral lobes of scutum; depressed area between scutum and scutellum with nine strong rugae; scutum shining, impunctate; scutellum with indistinct setigerous punctures, more than half as long as propodeum; propodeum ruguloso-reticulate, a narrow band at base, smooth; impression on side of pronotum rugose; mesopleura above with widely separated setigerous punctures, shining; mesopleural impression confluent punctate; metapleura with setigerous punctures becoming more distinct posteriorly; middle and posterior coxae delicately transversely lineolate posteriorly on apical half; apical teeth of trochanters well developed, conspicuous; radius arising from distinctly beyond middle of stigma; radial cell long but not attaining extreme apex of wing; metacarpus not conspicuously beyond apex of radial cell; extreme length of first discoidal cell slightly greater than that of the first cubital; second abscissa of cubitus much more than half as long as recurrent vein; submedian cell sparsely hairy, distinctly glabrous at apex; first branchial cell glabrous at base; nervellus interstitial; mediella nearly three times as long as lower abscissa of basella, the latter with upper abscissa and nervellus about subequal; radiella strongly sinuate, the radiellian cell very narrow at middle.

Abdomen hardly longer than head and thorax combined; first tergite not twice as long as broad at apex, with a distinct impression at base, and entirely strongly longitudinal aciculate, the spiracles before basal third and farther from each other than from base of tergite; second tergite about as long as broad at apex, completely strongly longitudinally aciculate except a small elliptical median area on lateral depressed margins; third tergite very nearly as long as broad at apex, delicately aciculate on basal half; remainder of dorsum of abdomen smooth; ovipositor sheaths as long as the body.

Black; head faintly tinged with red; antennae black; scape and pedicel, clypeus and palpi brownish-black, the clypeus and palpi paler; mandibles testaceous, black at apex; legs rufous, middle and posterior tarsi faintly infuscated; first three abdominal sternites reddish brown; second tergite with two large lateral spots on apical half tinged with red; wings subhyaline; stigma brown with a distinct pale spot at base; veins brown.

Type.—1108.1 Cornell University Collection.

Type locality.—Truro, Nova Scotia.

Described from one female collected by R. Matheson, August 12, 1913, and named in honor of Dr. J. Chester Bradley of Cornell University.

Very similar to *mellipes* Provancher and *aegeriae* Rohwer. Runs to couplet 27 in Muesebeck's key (Proc. U. S. Nat. Mus., Vol. 80, Art. 23). Differs from *mellipes* in the rufous legs, the sculpture of the third abdominal tergite, and the interstitial nervulus. Differs from *aegeriae* in the lighter coloration of the head, scape and pedicel, clypeus, mandibles, posterior tibia and tarsi, three basal sternites of the abdomen, second abdominal tergite, ovipositor sheaths and pale spot at base of stigma; in the darker coloration of the palpi, and in the thorax being entirely black; in the relatively larger eyes, shorter malar space, shorter maxillary palpi, more prominent prescutum, and lineolate middle and posterior coxae; in the interstitial nervulus, the longer mediella, strongly sinuate radiella and in basella being interstitial with the transverse abscissa of subcostella. It is also close to the European *marginator* (Nees), but I have seen that species and *bradleyi* appears to be distinct. *M. marginator* has a much blacker head and smoother abdomen than *bradleyi*, the first tergite being mostly, the second at the apex, and the third entirely, smooth; also in *marginator* all coxae, except the posterior at the base, are black; the middle tarsi and posterior tibiae and tarsi are black; the abdomen entirely black; the nervulus is postfurcal and the radiella is not sinuate; also in *marginator* the eyes are relatively smaller and the ovipositor very much longer than in *bradleyi*.

FAUNAE OF NESTS OF THE MAGPIE AND CROW IN WESTERN MONTANA.¹

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Incidental to the collecting of ticks and other animal parasites in the Bitterroot Valley of Southwestern Montana, a number of nests of magpies, *Pica pica hudsonicus*, and a nest of the common crow, *Corvus brachyrhynchos*, were examined particularly for blood sucking dipterous larvae, *Protocalliphora* spp.

This type of parasitism has been recorded from widely separated districts and has been found common in the nests of many passerine birds wherever a systematic search has been made. Only the more pertinent references to the literature are mentioned below.

The first records for North America are by Henshaw (1908) who observed a fatal infestation on nesting bluebirds, *Sialia sialia*, at Wellesley Hills, Mass. Specimens reared by him were described later as *Protocalliphora splendida sialia*

1. Contribution from the Rocky Mountain spotted fever Laboratory of the United States Public Health Service, Hamilton, Montana.

TABLE I—Collecting and Rearing Data of *Protocalliphora avium* Shannon & Dobrosky

Nest Number ¹	1	5	6	12	14	20	23	Total
Nest of	Magpie	Magpie	Crow	Magpie	Magpie	Magpie	Magpie	..
Date collected	5-28-31	5-28-31	5-28-31	5-31-31	5-31-31	6-2-31	6-2-31	..
Fledglings in Nest	3	6	1	4	6	Deserted Recently	Deserted Recently	..
<i>P. avium</i> puparia in Nest	8	3	0	7	12	2	3	35
<i>P. avium</i> , larvae in Nest	190	187	47	373	343	9	180	1329
No. pupating in laboratory	139	134	19	346	326	9	100	1073
Average pupal period in days	10.43	10.26	9.73	11.24	11.21	..	11.88	11.02 ²
No. adults emerging	135	125	19	330	290	9	84	992
Males	71	63	10	170	146	..	47	507
Females	64	62	9	160	144	..	37	476
Sex ratio (males to females)	1.11	1.02	1.11	1.06	1.01	..	1.27	1.07

¹Many old, abandoned nests were examined but contained no viable *Protocalliphora* larvae or puparia.²Weighted average.

by Shannon and Dobrosky (1924).

Important contributions to recorded faunae of birds' nests, particularly regarding biological observations on blood-sucking dipterous larvae, have since been made by Coutant (1915), Plath (1919 a, b), Arnold (1919), Keilin (1924 a, b), Dobrosky (1925), McAtee (1927, 1929) and Johnson (1929). Arnold in Colorado reports myiasis with deep, active invasion of tissues of nestling birds, particularly the western meadowlark. Shannon and Dobrosky (l.c.), in a monographic treatment of the genus described adults reared by Arnold as *P. hirudo hirudo* and others taken from crows nests at Ithaca New York as *P. avium avium*.

Chalcid parasites *Mormoniella vitripennis* (Walker) [syn. *M. (Nasonia) abnormis* Boh.], were reared from puparia of *Protocalliphora* spp. by both Plath and McAtee. Plath also records *Tinea occidentella* (Chambers) as predacious on normal and parasitized puparia.

The extreme infestations of *P. avium* larvae observed by us indicated that the large, twig canopied, mud plastered, fiber lined nests of the western magpie served as favorable habitations and the nesting birds as excellent hosts. From 5 of the magpie nests examined, 108, 187, 190, 343 and 373 larvae were taken respectively. An infestation of 343 larvae in the nest of a crow at Ithaca, New York, was the previous maximum number as reported by Dobrosky (l.c.).

The firm mud-plastered inner shells of the nests were removed from their massive outer framework of twigs and placed in sacks for later examination in the laboratory. An accurate census was then taken of the *Protocalliphora* larvae and puparia present. A few of the latter were found in each nest. As the larvae were well developed, most of them were placed in dry sand for pupation. The sand was screened daily and the puparia isolated. The numerous other insects and arachnids were pinned or preserved in alcohol.

Table I presents the collection and rearing data for *Protocalliphora avium* and Table II a qualitative list of the various insects found in the nests.

TABLE II—QUALITATIVE LIST OF NEST INHABITANTS.

I. Crow, *Corvus brachyrhynchos*, 1 occupied nest.

Diptera—*Protocalliphora avium* Shannon and Dobrosky (larvae and puparia);
Culicoides biguttatus Coquillett (blood-gorged adults).

Coleoptera—*Dermestes signatus* Leconte (adults).

Mallophaga—off fledgling; *Docophorus communis* Nitzsch; *Myrsidea subaequalis* (Lyonet).

II. Magpie, *Pica pica hudsonicus* (Sabine) 6 occupied nests.

Diptera—*Protocalliphora avium* Shannon and Dobrosky (larvae and puparia);
Hylemia sp. (adults); *Culicoides crepuscularis* Malloch (blood-gorged adults).

Coleoptera—*Dermestes signatus* Leconte (larvae and adults); *Dermestes talipinus* Mann. (adults); *Anthrenus occidentens* Casey (adults); *Helops convexulus* Leconte (adults); *Cratraea* sp. (adult).

Hymenoptera—*Mormoniella vitripennis* Walker (parasitic in *P. avium* puparia);
Morodora armata Gahan, n. gen. and sp. (parasitic in *P. avium* puparia).

Lepidoptera—*Tineidae*, undetermined species (larvae).

Mallophaga—*Docophorus communis* Nitzsch; *Myrsidea eury sternum* (Nitzsch).

Many deserted nests were examined which yielded empty *Protocalliphora* pupal cases, a few spiders and one pseudoscorpion that has been determined as *Hesperochernes montanus* new species by J. C. Chamberlin who is describing this arachnid elsewhere.

As shown in Table II two species of chalcid parasites emerged from isolated puparia. *Mormoniella vitripennis* (Walk.) was reared from two collections. Another chalcid which proved to be new was reared from several other lots of puparia and is described in an accompanying paper as *Morodora armata* by A. B. Gahan of the Federal Bureau of Entomology. This species was induced to parasitize fresh puparia of *P. avium* under observation in test tubes. The adult parasites emerged in less than 36 days. Parasites were reared only from puparia collected in the nests and not from any that pupated after collection with the exception of the few experimentally parasitized.

BIOLOGICAL NOTES ON *PROTOCALLIPHORA AVIUM* S. AND D.

Every occupied nest examined contained *Protocalliphora* larvae as shown in Table I. The larvae were confined to the fibrous mass of rootlets and stems that lined the nest and in the accumulation of very dry, scaly, duff that had sifted through this mass to the tight mud-plastered floor. No larvae were found on or in the fledglings as has been reported by Arnold (l.c.). Most larvae were of uniform size and in an advanced stage of development with very few early instars present. In this respect their development was well timed with that of the host as the fledglings were feathered and nearly ready to leave the nests. Bright red blotches of undigested blood showed plainly in the fore-gut of the living larvae. Ten were dissected and the gut contents smeared and stained revealing the nucleated erythrocytes of avian blood.

Many old nests were examined for *Protocalliphora* pupal cases but relatively few were found, indicating either that previous infestations had been light, that scavengers had destroyed the pupal cases, or perhaps that the advanced larvae had left the nests and dropped to the ground for pupation. This might account for the observation of Plath (1919 a) who recovered only 43 larvae and puparia from the nest of a goldfinch in which he placed 90 nearly mature larvae. He states, "The larvae had lost their bearings and fallen from the nest."

No difficulty was encountered in rearing imagoes from the mature larvae collected. Larvae were placed in jars of clean dry sand into which they burrowed for pupation. The average pupal period of 983 reared adults was 11.02 days at room temperature during the months of May and June which approximated 24°C. Four-tenths of one per cent of the larvae died without pupating and a pupal mortality of 5.3 per cent was experienced.

The nests of magpies and crows appear to offer an optimum type of habitat for *P. avium* and it is possible that these birds are the usual hosts, while in the nests of smaller, beneficial species, the parasites may be injurious and even fatal to nestling birds as reported in the literature. Certainly, the magpie nestlings observed by us appeared healthy and of good flesh, with only minute lacerations on the breast to indicate feeding by the generous infestations of maggots present.

NOTES ON OTHER INSECTS.

Dermestid larvae were abundant in the nests and after removal to the laboratory were observed destroying viable puparia of *P. avium*. Eleven adults were taken from the crow nest, and one magpie nest yielded forty-seven larvae of various sizes. Both collected and reared adults were later identified as *D. signatus*.

Midges, *Culicoides biguttatus* and *C. crepuscularis* were abundant in nests built close to a stream. Many of these were gorged with blood and seemed perfectly at home in the debris of the nests.

The fledgling crow was infested with Mallophaga of two species, *Docophorus communis* Nitzsch and *Mrysidea subaequalis* (Lyonet). *D. communis* was also present on the magpies but associated with *M. eurysternum* (Nitzsch).

Acknowledgements: Much of the insect fauna herein recorded was determined through the kindness of Harold Morrison by A. B. Gahan, H. S. Barber, E. A. Chapin, Alan Stone, J. M. Aldrich, C. T. Green, and C. Heinrich. We are also indebted to J. C. Chamberlin who determined the pseudoscorpion.

SUMMARY.

1. Extremely heavy infestations of *Protocalliphora avium* are recorded from nests of magpies, 373 larvae being taken from one nest containing 4 fledglings. Forty-seven larvae were also found in the nest of a crow.

2. Two hymenopterous parasites were reared from collected puparia, *Marmoniella vitripennis* (Walk.) and *Morodora armata* new genus and species described in an accompanying paper by Gahan. Parasitism of reared *P. avium* pupae was accomplished in the laboratory with the latter parasite, a new generation of adult chalcids being recovered.

3. Larvae of *Dermestes signatus* were observed to be predacious on *P. avium* puparia. This little known dermestid species appeared to be common in the birds' nests examined.

4. Blood-gorged midges, *Culicoides biguttatus* and *C. crepuscularis* were abundant in several inhabited nests.

5. Sixteen species of insects and arachnids are reported from crow and magpie nests in Western Montana.

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DESCRIPTION OF A CHALCIDOID PARASITE OF PROTOCALLIPHORA (HYMENOP.)

BY A. B. GAHAN

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Specimens of a chalcidoid parasite reared by Wm. L. Jellison and Cornelius B. Philip, of the Rocky Mountain Spotted Fever Laboratory of the United States Public Health Service at Hamilton, Montana, from pupae of *Protocalliphora avium* Shannon and Dobrosky infesting bird nests appear to represent a genus and species new to science and are described below.

FAMILY MISCOGASTERIDAE.

Morodora new genus.

In Ashmead's classification of the Chalcidoidea this genus runs directly to the tribe *Tridymini* and in the key to genera of that tribe runs to *Oxyglypta* Foerster, but is at once separated from that genus as well as several others in the tribe by the fact that the antennae have three ring joints and a 5-jointed funicle. It differs from *Tridymus* Ratzeburg by having the anterior margin of clypeus distinctly emarginate instead of produced, in the shape of abdomen which is nearly circular in outline, and in the swollen and spinose front legs.

Female.—Head viewed from above transverse but rather thick antero-posteriorly. The occiput very slightly concave, vertex broad, ocelli in a low triangle, the frontal depression broad and not deep; viewed from in front the head distinctly wider than high, elliptical in outline, the antennae inserted just above clypeus or a little below a line connecting the lower extremities of eyes; eyes short oval, nearly circular, less than twice as long as the malar space, bare; clypeus distinctly defined by a fine groove, its anterior margin weakly concave; mandibles each with three teeth; labial palpi 3-jointed; maxillary palpi 4-jointed. Antennae 13-jointed; scape slightly thickened, flattened beneath, not reaching to the front ocellus; pedicel a little longer than broad; three ring-joints transverse but easily discernible; funicle 5-jointed, the joints all subequal in length and breadth and each somewhat broader than long; club 3-jointed, not broader than the funicle, the first and second joints similar in dimensions to the funicle joints, the apical joint much smaller. Thorax about twice as long as broad, appearing slightly flattened above; pronotum large, as broad as the mesonotum and more

than half as long as the mesoscutum, rounded and immargined anteriorly, its neck short; mesoscutum broader than long, the parapsidal grooves complete, deeply impressed, and broadly separated at their posterior termini; scutellum with very faint indication of a transverse depression before the apex; axillae broadly separated by the base of scutellum; postscutellum prominent but not large; propodeum with a weak median carina, without lateral folds and without a neck, the spiracles round. Forewings moderately large, the marginal vein nearly twice as long as stigmal, the postmarginal as long as the marginal or a little longer; discal cilia numerous but weak, marginal fringe absent; hind wings with the marginal vein as long as the submarginal, the marginal fringe present but weak. Legs stout; front coxae nearly as large as the posterior pair, their femora distinctly swollen, their tibiae moderately stout and distinctly shorter than the femora, armed apically with a fringe of short stiff spines, the tibial spurs about one-third as long as the tibiae and slightly curved; front tarsi not longer than their tibiae, the basitarsus a little longer than the tibial spur and equal in length to the three following joints together, the first to fourth joints beneath armed with a double row of short thick spines, the fifth joint longer than the two preceding joints together, unarmed, the claws simple; median legs not thickened, their coxae small, the tibiae apically and the first and fourth tarsal joints armed with spines similar to those of the front legs but somewhat weaker; hind femora slightly thickened, their tibiae more slender with two very distinct and nearly equal tibial spurs and armed apically with numerous short thick spines, the tarsi beneath with weaker spines. Abdomen subsessile (apparently with a very short strongly transverse petiole, as broad as the thorax, a little longer than broad, subcircular or broadly elliptical in outline, the first segment comprising about one-third its length, following segments subequal, the first five segments weakly emarginate medially; the ovipositor concealed.

Male.—Scape greatly enlarged, as broad as long, more or less compressed, concave on the outer lateral face, smooth and slightly convex on the inner face; pedicel about twice as long as broad; flagellum as in female. Abdomen subpetiolate, about as broad as the thorax, subelliptical in outline, and nearly twice as long as broad, the tergites very weakly, if at all, emarginate medially. Otherwise like the female.

Type of the genus *Morodora armata*, n. sp.

***Morodora armata* n. sp.**

Female.—Length 2.4 mm. Head, thorax, and abdomen with nearly uniform, fine, shallow reticulation, distinctly shining, the propodeum more deeply sculptured and dull. Lateral ocelli about twice their own diameter from the eye margin and the same distance from the front ocellus, the latter located above the antennal depression and in nearly the same horizontal plane as the lateral ocelli, the vertex nearly flat; antennae rather short, the flagellum not clavate; lobes of the mesoscutum very distinct but not strongly convex; metanotum medially (postscutellum) produced to the same level as the apex of scutellum and sculptured like it; propodeum with a small area at apical middle smooth and shining, otherwise opaque. Abdomen shorter or not longer than the thorax.

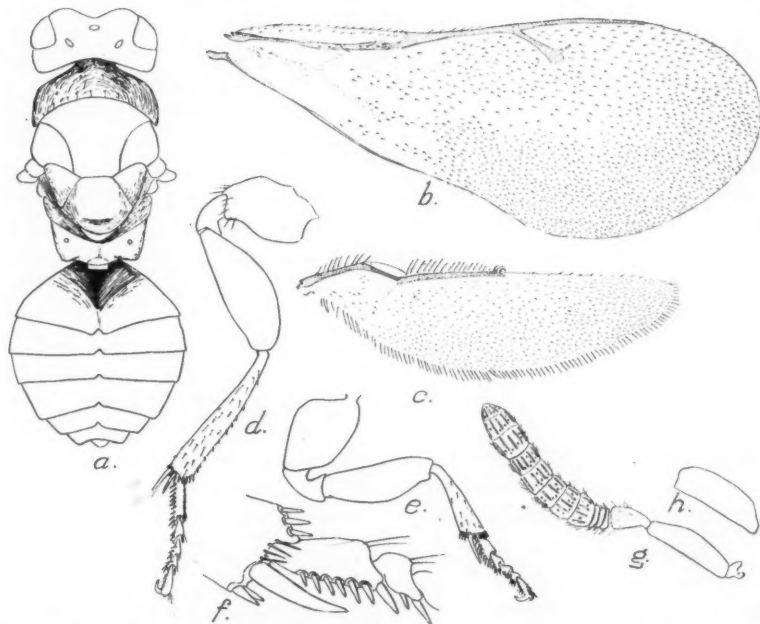
Head, thorax, and abdomen deep black; antennae, mouthparts, venation of wings, all coxae, and all femora, except apices of latter, concolorous with the

body; trochanters more or less, apices of all femora, all tibiae, and all tarsi dark reddish testaceous or fusco-testaceous; wings hyaline.

Male.—Length 2.25 mm. Similar to the female in every respect except for the sexual differences pointed out in the generic description.

Type locality.—Ravalli County, Montana.

Type.—Cat. No. 43900, U.S.N.M.



Morodora armata Gahan. Female; a, dorsal view of body; b, forewing, c, posterior wing; d, hind leg; e, front leg; f, apex of front tibia and two basal joints of tarsi; g, antenna; h, scape of antenna in lateral view. (Drawings are by Eleanor A. Carlin).

Described from fourteen female and six male specimens said to have been reared from pupae of *Protocalliphora avium* Shannon and Dobrosky collected from the nests of crows and magpies by W. L. Jellison and C. B. Philip of the United States Public Health Service.

NOTES ON THE HEPTAGENINE SPECIES DESCRIBED BY CLEMENS FROM THE GEORGIAN BAY REGION, ONT. (EPHEMEROP.)*

BY J. MCDUNNOUGH,

(Continued from Page 24.)

***Ecdyonurus ruber* McD.**

Ecdyonurus ruber McDunnough, 1926, Can. Ent., LVIII, 192.

Heptagenia flavescens Clemens (nec Walsh) 1913, Can. Ent., XLV, 252, Pl. V, figs. 8, 9; id., 1915, Cont. Can. Biol., 134, Pl. XV, figs. 4, 5.

Breeding at Go Home Bay confirmed what had already been suspected from our collections and breedings in the Ottawa and Knowlton regions, viz., that the nymph and female imago referred to by Clemens under the name *flavescens* belong to the species, *ruber* McD. Nymphs were secured at the Flat Rock Falls, the

identical locality where they had been collected by Clemens, and two males, three females bred through to the adult stage (June 19, 21, July 2). The abdominal tergites of the nymph are not always as immaculately brown as indicated by Clemens; there are frequently traces of pale dashes laterally and subdorsally along the anterior margins of the segments, serving to a certain extent to define the usual median and submedian dark bands and submedian dots. Such paling of coloration is particularly noticeable on segments 7 and 9 and occurs most frequently in our long series of nymphs from the St. Lawrence river (Cascades Point, Que.); those from more northerly localities tending to much more uniform dark abdomens. Such specimens show, however, none of the pale granulation characteristic of *rubromaculatus* and furthermore have the distinct ventral abdominal pattern, consisting of a large, inverted U-mark on segment 9 and a medium hemispherical dark patch on 8; there are also at times indications of the six dark dots as in *rubromaculatus*. Diminution in size of the median patch and occasionally the lack of the cross-bar of the U fall under the heading of pattern-variation.

According to male genitalia the species falls into the the *pulchellus* group and its distinguishing characteristics have already been given in the original description. Apart from genitalia the smaller size and longer first tarsal joint of male foreleg serve to separate it from dark *rubromaculatus*. Along the Rideau river at Ottawa and in the Gatineau region (Wakefield, Que.) its main flight appears to be in mid-June but in the Ottawa and St. Lawrence rivers and the Mid Yamaska river at Fulford and Foster, Que. (Knowlton region) it does not usually gain maturity until July and August.

***Ecdyonurus luteus* Clem.**

Heptagenia lutea Clemens, 1913, Can. Ent., XLV, 252, Pl. V, fig. 2; *id.*, 1915, Cont. Can. Biol. 135, Pl. XV, fig. 2.

This species is recorded as abundant along the open shores of the Georgian Bay Islands with occasional occurrence in the rapids of the Go Home and Musquash rivers; Mr. Walley found the same conditions prevailing and is of the opinion that *luteus* is predominantly a species of the open water region. As no type was designated by Clemens I believe, therefore, I am justified in naming as holotype a pinned male specimen in the Canadian National Collection from Long Island. Go Home Bay, the nymph taken June 14, imago emerging June 29 (Clemens No. 49); the female allotype (so designated by Clemens on pinned specimen) is one of the Musquash Falls breedings, imago emerging July 3 (No. 53). Both are in poor condition but with the details of abdominal maculation recognizable.

A series of nine males, three females, bred by Mr. Walley, is before me; these with one exception all emerged from nymphs taken along the exposed shore of Island 144, June 23-July 5; the single exception is a male from a Flat Rock Falls nymph, emerged June 27. Based on this material I offer a slightly more amplified description of the adult.

Male. Eyes (living) pale green. Head anterior to ocelli pale whitish ochreous with a faint oblique ruddy streak on carina and narrow ruddy rings at bases of antennae; region of ocelli and vertex yellowish to yellow-brown with ruddy brown oblique streaks posteriorly and at times a similar colored spot behind median ocellus and a narrow line along margin of eyes. Pro and mesonotum very pale ochreous with scutellum broadly creamy white; pleura whitish yellow with light brown tinge on an area between fore and mid legs and at times also on meso-

sterum; anterior and posterior margins of coxae streaked with smoky and with a faint pinkish patch behind the posterior black streak. Anterior portion of metanotum creamy, posterior portion light brown, contrasting with the pale yellowish abdomen and giving the appearance of a darker basal band. Abdominal segments 1-7 whitish yellow, hyaline, the dorsal posterior portion crossed by narrow black lines; no stigmatal dots; segments 8-10 opaque creamy-white with pink shading dorsally on 8 and 9 and at times on anterior portion of 10. Forceps and setae pale, the latter finely banded intersegmentally with smoky. Legs pale amber; forefemur shaded with smoky and all femora banded in median and apical areas with purple-red; tip of tibia, tarsal intersections and claw smoky. The foretarsal first joint is comparatively short, the relation of the joints 1.5:3:3:2:1. Wings hyaline, the pterostigmatic area of forewings light amber with slight ruddy tinges; three first longitudinal veins dark smoky amber, remainder, including the well-developed cross-veins, blackish.

Female. Paler than male. Head distinctly yellow in ocellar region; a spot behind the median ocellus and the whole posterior portion of vertex tawny brown, extending laterally down along edge of eyes to a point opposite lateral ocellus; occiput and face anterior to antennae pale ochreous, semihyaline. Thorax and abdomen dorsally as in male; pleura paler with scarcely a dark shade and no dark or pinkish shades at bases of coxae; at times slight yellowish tinges in area between bases of fore and mid legs.

The pale coloration and lack of stigmatal dots on abdomen is sufficient to distinguish the adults from allied species; the male genitalia are of the *pulchellus* type. The *nymph* has been adequately described and figured by Clemens; there should be no difficulty in recognizing it. It might be noted that immature nymphs are paler than mature ones, the posterior border lines of segments being very narrow or even entirely lacking on segment 9. Also that the few nymphs taken in the Go Home and Musquash rivers are rather darker than the Go Home Bay series, the posterior borders of segments especially being broader and more as in *fuscus*. However, the bred male mentioned above agrees with the other adults so I presume the difference to be merely varietal.

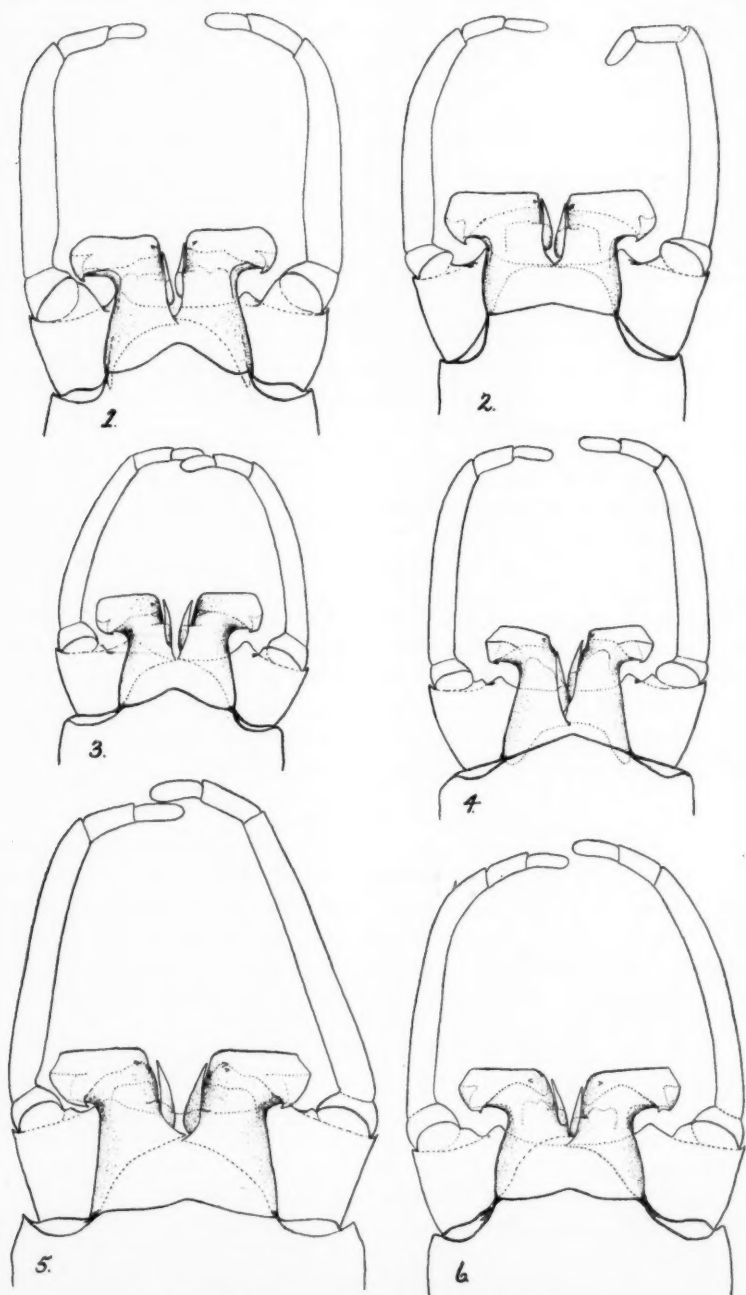
The species is not uncommon in both the Rideau river and Ottawa river districts of the Ottawa region, specimens from the latter river occurring most frequently in late July and early August and being slightly smaller in size; we also have small series from various points on the St. Lawrence river (Vaudreuil, Lachine, St. Lambert) taken in early July and a single bred female from Brome Lake, Knowlton, Que. Single females from Normandale and Southampton show that the species occurs in both Lakes Erie and Huron.

***Ecdyonurus fuscus* Clem.**

Heptagenia fusca Clemens, 1913, Can. Ent., XLV, 254, Pl. V, fig. 7; *id.*, 1915, Cont. Can. Biol., 136, Pl. XVI, fig. 1.

Ecdyonurus fusca McDunnough, 1925, Trans. Roy. Soc. Can., XIX, 3rd Ser. 222.

The species was bred from nymphs secured on June 16 at Sandy Grey Falls on the Go Home river; judging by Clemens' notes only three adults were secured—the male Holotype, No. 43, emerged June 24; the female Allotype, No. 45, emerged June 25; and a male paratype, No. 42, emerged June 24, the dates June 23 and 24 given by Clemens evidently referring to the emergence of the subimagos. The holotype, as I have already noted, is a damaged alcohol specimen from which,



MALE GENITALIA OF ECDYONURUS SPECIES.

however, a genitalic slide has been made, the allotype is pinned and the paratype consists of fragments of wings. Besides these adults I have before me a number of the nymphs collected by Clemens in alcohol and the fragmentary nymphal skins of the type specimens.

Mr. Walley found the nymphs very plentiful in the rapids of the Musquash river on June 9th and from some of these bred a series of one male, six female pinned adults, one male, one female adult in alcohol and one male, one female, subimagos, June 9-15; from a study of this material in combination with the above mentioned type material of Clemens I offer the following notes and amplifications. Regarding the two figures given by Clemens of the nymph (evidently a female), that in the Canadian Entomologist is distinctly the better print as it shows to a certain extent (but still not sufficiently) the marked contrast between the pale yellow abdominal segments and the deep black-brown border along the posterior third-fourth of each segment dorsally. What maculation there is is in a much paler shade of brown than the border and consists in general of (1) a transverse streak along the anterior margin; (2) a broken medio-dorsal line, flanked by two slightly oblique streaks, these streaks on the posterior segments being frequently broken up into two superimposed dots, the lower of which touches the dark posterior band; (3) two slight lateral projections from the posterior band into the pale section which are quite plain in Clemens' figure. This maculation is faintest on segments 8 and 9 especially in the males, and tends in the females to become suffused on segment 6 (which, at times is quite dark dorsally) and also to a lesser extent on segments 2-4. Occasionally the ends of the transverse anterior dash bend down and are even produced to connect with the posterior band. The lateral prolongations of each segment form very long, sharp spines. Ventrally the dark posterior banding shows a pale medio-ventral spot and the anterior margin of the bands is somewhat irregular, especially in the females, where distinct lateral projections as on the upperside are evident. As a general thing the maculation of the ninth segment consists of the two dark lateral patches as mentioned by Clemens; occasionally, however, there are traces of an antero-median spot and still more rarely this spot is joined to the lateral ones, forming an anterior dark band across the segment. Immature nymphs, in contradistinction to those of *luteus*, are much darker in color than mature ones, the abdominal segments being largely brownish with isolated pale spots and patches.

Besides topotypical nymphs there are long series before me from Gull River Falls, Minden, Ont.; the St. Lawrence river at Cascade Point and Lachine, Que.; the Rideau river at Ottawa; and the Mid Yamaska and Mississquoi rivers of the Knowlton, Que., region, including nymphal skins of bred material from the majority of these localities. From southern Ontario I have noted isolated nymphs from Dundas and Tillsonburg. In this material the amount of color and pattern variation is surprisingly small; the St. Lawrence nymphs are the palest, some of them lacking all maculation except the posterior dark banding of the segments; the Rideau river nymphs have a somewhat darker appearance and the posterior banding is not so noticeably deeper in color than the other maculation. As regards the adults Clemens' description of the male is good (especially for alcohol material) as far as it goes, but it needs a certain amount of amplification.

Male. Eyes (living) large, pearly-gray, becoming purple-black when dried.

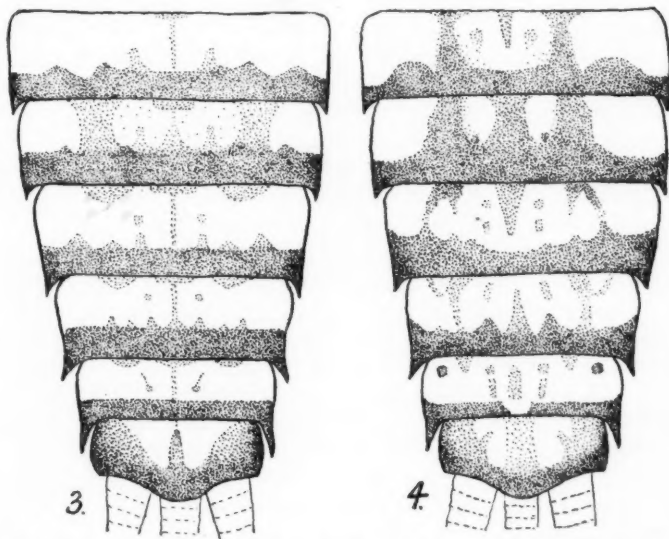
On the head the epistoma is pale smoky hyaline with smoky brown oblique streaks on each side of the carina; the section anterior to the ocelli is pale yellowish with fine ruddy rings around the bases of the antennae which are pale smoky; the vertex is rather bright brown with yellowish shades behind the lateral ocelli. The prothorax is largely smoky; the mesonotum is deep brown normally with pale ochreous or whitish shades on the rear half of the scutellum and in the median depression anterior to the scutellum, where several dark streaks are evident. In certain specimens the color of the mesonotum is a much paler brown and in these instances the pale shades around the scutellum are more extended and show traces of ruddy suffusion; in others (noticeably those from the Rideau and St. Lawrence rivers) there is a deepening of the brown color which tends to efface all the pale scutellar shades.

There is a ruddy shade split by a pale line on the pleura anterior to the base of the forewings and below this an oblique yellowish-ochre streak extends from forewing-base to base of foreleg, a somewhat similar one occurs at base of hindwing, the remainder of the pleura being clouded with brownish, as is also the sternum. The metanotum is largely deep brown with the median anterior projection paler. The abdomen dorsally presents normally a distinctly uncontrasted brown appearance; on closer examination it is seen that the tergites 1-7 are dull smoky amber, semi-hyaline, with the posterior one-third transversely banded, with deeper brown, this color extending forward in spiracular area and forming indistinct marks somewhat like inverted question marks, filled out with paler color; there is a fairly complete geminate median dark line. In specimens with paler thorax (as referred to above) the contrast between the two areas is somewhat sharper, giving a slightly banded appearance. On the other hand numerous specimens occur (Rideau and St. Lawrence regions) in which the dark areas are much extended and almost the whole segment appears deep brown; in such specimens the posterior band sends broad subdorsal projections forward, the upper edges of which curve slightly upward, thus partially enclosing, in conjunction with the median line, a series of paler streaks bordering the aforementioned line. Tergites 8-10 are opaque, suffused almost entirely with rather a bright brown, and with the lateral edges of 9 and 10 (and sometimes 8) distinctly bordered with alabaster white, this color occasionally extending around the entire posterior border of 10. Ventrally the abdominal segments are dull, pale, smoky amber, immaculate, the three posterior segments tending to become more ochreous or light brownish; in the dark specimens mentioned above the colors become deeper and there is a trace of darker triangular brown shades alongside the medio-ventral line. Forceps and setae very pale smoky amber, the latter finely banded intersegmentally with brown. Legs with all coxae smoky brown, the edges and bases streaked with blackish; remainder of legs light amber, with fore femora suffused with smoky and all femora with median and apical purple-red bands; tarsi with joinings marked in black; claw blackish; first tarsal joint normally slightly more than one-third the length of second. Wings hyaline with slight amber suffusion in pterostigmatic region *but no ruddy shades*; first three veins smoky amber, remainder blackish; crossveins *rather fine*, blackish, with no tendency to accumulate in the bullar region.

Female. Head anterior to antennae as in male; ocellar region from rear

of lateral ocelli forward to antennae distinctly light yellow; vertex of head marked as follows in *bright ruddy-brown* (Ridgeway, Hay's russet, Pl. XIV, k, is closest) --a hemispherical patch behind median ocellus, bordered posteriorly by a narrow yellow band; the entire remainder of vertex except a fine median line and the lateral corners, the color extending down along the margins of eyes to the antennal region; occiput narrowly pale smoky.

Mesonotum paler than in male, dull clay or olive-brown with the scutellar area suffused with creamy or pale ochreous. Ruddy shade and pale streaks on pleura as in male; bases of legs at times with purplish tinges but blackish streaks not so prominent on coxae. Abdomen dorsally paler than in male, of a distinctly banded appearance as there is less tendency to suffusion or extension of the dark bands on posterior third of segments 1-7; median dark line present on all segments; rear segments opaque, light creamy brown, 8 and 9 banded with darker as in anterior segments; white lateral borders prominent. Ventrally very pale amber, segments 8 and 9 whitish, with slight pinkish suffusion on 8 anteriorly, extending somewhat on to 7. Remainder much as in male.



Last six abdominal segments of mature nymph (dorsal view) of 3, *Ecdyonurus fuscus* Clem. (Musquash River, Ont.); 4, *E. rivulicolus* n. sp. (Fairy Lake Cr., Hull, Que.)

The subimago has rather evenly gray wings, the crossveins being finely marked in blackish without suffusion.

The material before me comprises long series of both sexes from Georgian Bay region, Ont.; Severn, Ont.; Burks Falls, Ont.; Jordan, Ont.; Ottawa, Ont. region (both Rideau and Ottawa rivers); St. Lawrence region, including Prescott, Ont., Cascades Pt., Que., Vaudreuil, Que., Lachine, Que., St. Lambert, Que., La Prairie, Que.; Richelieu, Que.; Fulford, Que.; Boiestown, N. B.

The range of variation in the males is considerable but as no differences in the female sex can be distinguished and as our nymphal collections do not,

as yet, indicate more than one species, it seems safer, until further breeding can be done, to consider these differences as variational rather than specific.

Fuscus in the light of the above material appears to be distinctly an inhabitant as a nymph of the swifter water of our larger streams and rivers; emergence takes place almost entirely in the spring and early summer and after early July we have nowhere, as yet, found mature nymphs.

As a result of our intensive study of *fuscus* we have succeeded in segregating out what appears to be an undescribed but very closely allied species, in many ways intermediate between *fuscus* and the much larger *vicarius* Wlk. The nymphs are found in early spring in the small brooks and creeks in eastern Ontario and southern Quebec, the adult emerging in late May and during June, an occasional female appearing in July.

***Ecdyonurus rivulicolus* n. sp.**

Subimago. Wings greyish, much more contrastingly marked than in *fuscus*, due to a suffused dark bordering of the crossveins, resulting in a rather banded appearance.

Male. Eyes (living) pale gray with a decided greenish tinge (not bluish as in *fuscus*,) smaller also than those of *fuscus*. Head with anterior portion much as in *fuscus*, the vertex shows a deeper brown shade which is still further intensified behind the median ocellus and along the rear margin medially. Mesonotum deep brown with the paler scutellar areas of *fuscus* not so evident, and with rear margin tinged with blackish. Pleura deeper brown, with ruddy anterior patch as in *fuscus* but with the pale streaks from bases of wings less evident and deeper ochreous in color; rather heavy blackish suffusion above base of midcoxa, and a slight ruddy tinge also in this region. Metanotum similar in color to mesonotum. Abdomen dorsally with maculation essentially as in *fuscus* but with the contrast between the dark and pale areas much better defined; the dark posterior bands are broader, occupying on the anterior segments fully one-half the width of segment, the color is a deep purple-brown and the anterior margin is sharply defined and does not tend to suffusion as in *fuscus*; the pale areas are of a light amber color, less mixed with smoky than in the preceding species; the longitudinal median band is similar in color to posterior bands, well-defined on segments 2-9 and broader than in *fuscus*, especially in rear portion of each segment. The three opaque posterior segments are suffused with lighter brown, with paler lateral margins, but no distinct white border as in *fuscus*. Ventrally light yellowish on segments 1-7 with small brown patches in the postero-lateral angles of at least the anterior segments (best seen in alcohol material); segments 8 and 9 shaded with light brown. Forceps and setae pale smoky, the latter banded as usual. Legs much as in *fuscus* but with the black coxal streaks of mid and hind legs much broader and with black patches at the bases of all legs; the femoral bands are deeper in color (deep purple to purple-black) and considerably broader; the first tarsal joint is somewhat longer, being almost half the second one. The wings are hyaline with a distinct ruddy shade in the pterostigmatic area; the crossveins are noticeably thicker and bordered slightly but somewhat diffusely with brown in the costal area; there is a greater accumulation of crossveins in the bullar region than in *fuscus*. Length of body, 10 mm.; of forewing, 13 mm.

Female. The head, as compared with that of *fuscus*, shows a more inten-

sive yellow color in the ocellar region and the ruddy shades are much deeper, being deep wine-red with blackish suffusion along the posterior margin of the vertex. The mesonotum is light olive or yellowish ochre and there is some yellowish suffusion on pleura below base of wings and anterior to mid and hind coxae; the dark shadings around coxal area as in the male. Abdominal maculation similar to that of the male, the color of the tenth segment dorsally and the eighth and ninth ventrally (including the subanal plate) being dull clay. Other distinguishing characters from *fuscus* as in male, the ruddy pterostigmatal shade on forewings, however, being less prominent.

Holotype—♂, Fairy Lake Creek, near Hull, Que., May 30, 1927, (G. S. Walley); No. 3526 in the Canadian National Collection, Ottawa, Ont.

Allotype—♀, same data.

Paratypes—2 ♂, same data; 3 ♂, 1 ♀, Fairy Lake, Que., June 6, 1927; 1 ♂, 2 ♀, Hull, Que., May 29, 1923, (A. W. Richardson); 2 ♂, Broadview, Que., June 21, 1923, (R. Ozburn); 1 ♀, Broadview, Que., July 28, (G. S. Walley); 1 ♂, 1 ♀, Ottawa Golf Club, Que., June 11, 12, 1923, (R. Ozburn); 1 ♀, Ottawa Golf Club, Que., June 21, 1924, (G. S. Walley). The last two localities are also in the vicinity of Hull.

Besides the types I have before me series of specimens from Orillia, Ont., Kearney, Ont., Kazubazua, Que. and Knowlton, Que., as well as odd specimens from Caradoc, Ont., Tillsonburg, Ont. and Bothwell, Ont.; this indicates a rather wide distribution for the species.

The presumable nymph, taken mature in Fairy Lake Creek and a small creek at the Ottawa Golf Club at the time the type adults were captured, is close to that of *fuscus* as might be expected; the ventral banding is similar, with the important exception that on the ninth segment, in place of the two lateral dark marks (with occasionally a median spot) of *fuscus*, the whole posterior half of the segment, due to a fusion of these patches, is dark, with pale dots at the bases of each forcep-limb in the males and occasionally also in the females. The upper side maculation seems variable and for the figure I have chosen an average well-marked female specimen; in some nymphs, notably males, there is a great reduction of the dark maculation in the median and submedian areas of all segments but 6, the posterior dark banding being the only feature remaining; such nymphs can be distinguished from those of *fuscus* by the fact that the band of segment 9 and often of 8 is much reduced in width and broadly broken in the median section. In other cases the dark suffusion is increased until the pale median areas of all segments but 8 and 9 become very much as the sixth segment of my figure, in 8 and 9 there is generally a pale area in the anterior third of segment.

Up to the present we have only succeeded in breeding an odd female or two from nymphs similar to those above mentioned, so that there is still the possibility of another species being involved. Until, however, series of bred specimens are available and, further, the nymph of the allied species, *vicarius* Wlk., is definitely placed, it would be unwise to attempt any further separation in this difficult group.

In conclusion I venture to describe a species belonging to the *interpunctatus* group. This species is quite common in the Ottawa region along with *canadensis*

and there is a good deal of probability that the undetermined nymph figured by Clemens (1913, Can. Ent., Pl. V, fig. 4) belongs here; no definite breeding associations have as yet been made but nymphs similar to the figure have been taken in the Rideau river at Ottawa, where the new species also occurs.

The species is very similar to *interpunctatus* but differs primarily in the decidedly greater length of the first tarsal joint in the male which is about half the length of the second joint in normal specimens. In typical *interpunctatus* (which does not apparently occur in the Ottawa region but of which we have series from Illinois, Kansas and southern Ontario along the borders of Lake Erie and in the Niagara peninsula) the first tarsal joint is scarcely more than one-third the length of the second one and frequently even shorter. Furthermore, *interpunctatus* always shows quite heavy black markings on the face below the antennae and on the vertical clypeal flange as well as having a black lateral streak on the pronotum; in the new species these black markings are typically not present and only in a certain percentage of specimens do there appear traces of such maculation and then usually much reduced in extent.

***Ecdyonurus heterotarsalis* n. sp.**

Male. Eyes (living) light green. Head light yellow, semihyaline along anterior and posterior margins; vertex shaded with brown, deepest in a triangular patch covering posterior area, becoming almost purple-brown. Pronotum light yellow; mesonotum largely brown with the posterior area pale hyaline yellowish and the scutellum tipped with opaque ochreous; metanotum pale ochre-yellow. Pleura yellowish with a ruddy streak anterior to base of forewing and slightly deeper shading between fore and mid legs. Sterna yellowish. Abdomen dorsally pale, hyaline yellowish-white on segments 2-7, each finely bordered posteriorly by a blackish band; segments 8 narrowly in median area and 9 and 10 entirely shaded with ruddy brown; lateral portion of 8 opaque, pale yellowish; dark posterior banding on 8 and 9 as on preceding segments. Ventrally entirely pale, the opaque posterior segments 8 and 9 being almost alabaster white. Forceps and setae pale, latter very faintly dark-ringed intersegmentally. Legs light yellowish, the fore femur somewhat deeper in color; fore femora strongly, and mid femora faintly banded with blackish across middle and at apex, hind femur with only an apical dark spot; apex of fore tibia and all claws smoky; joints of fore tarsus as 3.5:6:5.5:4:2 (this is subject to considerable variation). Wings as in *interpunctatus* but the pterostigmatic area with less of a ruddy shade, merely being shaded with light amber. Length of body, 9 mm.; of forewing, 11 mm.

Female. General maculation much as in male but mesonotum much paler in color, being light ochreous with scutellar area scarcely paler. Head rather bright, light yellow with two black lateral dots on posterior portion of vertex, the area between being lightly shaded with ruddy (not always present) in more or less triangular form. The ruddy dorsal shading on posterior abdominal segments is not so pronounced as in the male.

Holotype—♂, Ottawa Golf Club, Que., July 2, 1924, (J. McDunnough); No. 3527 in the Canadian National Collection, Ottawa.

Allotype—♀, Ottawa, Ont., July 19, 1924, (F. P. Ide).

Paratypes—5♂, 5♀, Ottawa Golf Club, Que., July 2, 15, 16, 22, 1924, (J. McDunnough); 8♂, 1♀, same locality, June 27, July 16, 1923. (R. Ozburn);

5♂, same locality, July 15, 1924, (F. P. Ide); 2♂, 2♀, Ottawa, Ont., July 16, 19, 1924; 7♂, 8♀, Ottawa, Ont., July 19-26, Aug. 9, 1924, (G. S. Walley).

Besides numerous other specimens from the vicinity of the Ottawa river, the species is before me in series from the Rideau river at Ottawa, where it occurs mainly in June in slightly larger size. We also possess series from the St. Lawrence region (Cascades Point, Vaudreuil, Lachine), the Great Lakes region (Kingston, Normandale, Pt. Pelee) and from northern Illinois (Aurora, Oakwood, Chicago) which appear to fall here.

I have already discussed the variability with respect to the black maculation; it might be added that the male genitalia resemble greatly those of *interpunctatus* but appear to have the latero-apical margin of the penes somewhat more oblique than in this species. Of the other allied species *frontalis* may be distinguished from *heterotarsalis* by the presence of the black stigmatal dots on abdominal segments and the median dark band on hind femora and *canadensis* (which also has the short first tarsal joint) by the general dark suffusion on abdomen.

EXPLANATION OF PLATE I.

Fig. 1.—Male genitalia of *Ecdyonurus rubromaculatus* Clem., Flat Rock Falls, Go Home River, Ont. Fig. 2.—Male genitalia of *Ecdyonurus nepotellus* n. sp., Fulford, Que. Fig. 3.—Male genitalia of *Ecdyonurus ruber* McD., Paratype, Ottawa, Ont. Fig. 4.—Male genitalia of *Ecdyonurus pulchellus* Walsh, Pleasant Valley, Ia. Fig. 5.—Male genitalia of *Ecdyonurus fuscus* Clem., Holotype, Go Home River, Ont. Fig. 6.—Male genitalia of *Ecdyonurus luteus* Clem., Go Home Bay, Ont.

NEW SPECIES OF COLEOPTERA IV*.

BY W. J. BROWN.

Ottawa, Ontario.

Chlaenius crestonensis n. sp.

Male.—Length 12.4 mm. Body feebly convex. Dorsal surface of head, pronotum, and elytra green, not bronzed. Antennae, labrum, mandibles, palpi, scutellum, legs, and entire ventral surface including the elytral epipleura, black; vestiture bright reddish-brown.

Head seven-tenths as wide as the pronotum, brilliant and polished, sparsely and very minutely punctulate. Antennae with the third and fourth segments subequal; labrum feebly emarginate; palpi slender; mandibles normal.

Pronotum similar to the head in color; seven-tenths as wide as the elytra; subquadrate, the length equal to four-fifths the width; the side margins moderately arcuate in apical half, straight and just visibly converging basally, not sinuate before the posterior angles; the latter right, scarcely rounded; the basal margin strongly sinuate near the posterior angles. Pronotal punctures coarse, densely placed in the basal impressions and over the surface external to the impressions, sparse and feebly impressed near the anterior angles, an irregular row of punctures on each side of the sharply impressed median line, a few punctures near the anterior margin in front of the feeble transverse impression; a large impunctate area on each side of the median line, these areas joined at base.

Elytra colored like the head and pronotum but only feebly shining, the vestiture dense, giving the surface a rusty aspect in certain lights; the basal

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

margin arcuate at the humeri; the side margins parallel in median half; the intervals flat, finely alutaceous, closely and finely but distinctly punctate.

Punctures of the prothoracic venter coarse, sparse, and indistinct, the prosternal intercoxal process not margined or punctate. Meso- and metasternal episterna with coarse, close, very shallow punctures, the anterior margin of the latter five-ninths as long as the outer side; the metasternum similarly punctate on the sides, a wide median area impunctate. Abdomen rather coarsely punctate, the punctures moderately close at middle, closer on the sides. Anterior femora simple; middle tibiae without pubescent areas.

Holotype—♂, Creston, B. C., June 14, 1931, (G. Stace Smith); No. 3401 in the Canadian National Collection, Ottawa.

Allotype—♀, same data; Paratypes 3♂, 6♀, same data; 4♂, 1♀, same data, June 15, 1931; 1♂, same data, May 3, 1929; 1♂, same data, June 19, 1930; 1♂, same data, Nov. 3, 1931; 1♀, same locality, July 12, 1923, (C. S. Lallamand).

The paratypes measure from 12 to 13 mm. in length and are quite constant in their characters. The species traces to *harpalinus* Esch. in Horn's table (1876, Trans. Am. Ent. Soc., V, 255) and is closely allied to the latter. In *harpalinus*, the dorsum is black, the head and pronotum sometimes having a greenish luster, the labrum is squarely truncate, and the elytral intervals are feebly but distinctly convex and are closely punctate.

In the present species, the elytra are not darker in color than the head and pronotum. The shade of green of the dorsum is that seen on the head and pronotum of *pennsylvanicus* Say. The elytral vestiture is similar to but more dense than that of *harpalinus*, the hair-bearing punctures of the intervals being more numerous than in the allied species.

***Hydroporus falsificus* n. sp.**

Length 3.1 mm.; width 1.6 mm. Feebly ovate, widest just before the middle; feebly convex. Head very dark reddish-brown, the anterior margin slightly paler; pronotum black, the sides rather narrowly reddish-yellow; elytra very dark brown, becoming slightly paler at base; metasternum, coxal plates, and abdomen black; antennae yellow, the seven most apical segments feebly but distinctly infusate except at their bases; legs yellow, not infusate. Body moderately shining.

Head seven-tenths as wide as the pronotum, finely alutaceous, sparsely and microscopically punctulate. Width of pronotal base almost nine-tenths as great as the greatest width of the elytra; the pronotum indistinctly alutaceous; the punctures very fine and sparse at middle, less so near the base; the bead of the side margins narrow. Elytra widest at basal third; finely alutaceous; finely and not closely punctate.

Metasternum closely, rather coarsely punctate on the sides. Coxal plates indistinctly alutaceous, finely punctate. Abdomen not alutaceous, finely and rather closely punctate on the sides in basal half; elsewhere with sparse microscopic punctules. Anterior tarsi moderately dilated, the segments of equal width; the middle tarsi narrower. Sexual characters not evident.

Holotype—Wynndel, B. C., August 23, 1931, (G. Stace Smith); No. 3400 in the Canadian National Collection, Ottawa.

Paratypes—24, same data; 13, Erickson, B. C., August 27, 1931, (G. Stace Smith); 1, Copper Mountain, B. C., August 31, 1930; (G. Stace Smith); 1, Creston, B. C., April 18, 1930, (G. Stace Smith.)

The paratypes measure from 2.8 to 3.2 mm. In some of them, the elytra are a little paler than in the type, and in a few, the antennae are feebly and indistinctly infusate.

The species is a member of the *vilis* group, and like its allies, is not strongly characterized. From *compertus* Br., a species occurring in the same region, it may be known by the smaller size, infusate antennae, and more convex form. The body is distinctly narrower than in *vilis* Lec. and more convex than in *pacificus* Fall, *planiusculus* Fall, and *brumalis* Br. The elytra and antennae are darker than in all these allied species, although the elytra are fully as dark in some specimens of *compertus*. In *terminalis* Shp., the size is smaller, the body more parallel, the antennae more strongly infusate, and the pronotal bead wider.

***Ochthebius mimicus* n. sp.**

Length 1.8 mm.; width .9 mm. Robust, strongly convex; blackish, faintly bronzed, the legs reddish-brown. Labrum triangularly emarginate; ultimate segment of maxillary palpus not longer than wide; the penultimate segment very stout, its width equal to two-thirds its length; front with a very large fovea on each side and with a small median fovea near the pronotal margin, the area bounded by the foveae moderately tumid.

Pronotum about two-thirds as long as wide; the apical margin with a small but deep emargination near each anterior angle, this much as in *discretus* Lec. but with the angle broadly rounded; the side margins obtusely subangulate between the anterior angles and the emargination at middle; the latter abrupt and deep, forming a rectangular, very slightly prominent angle; the side margins behind the emargination straight and parallel, not converging; the basal margin feebly arcuate, sinuate near each hind angle, the latter acute and prominent; lateral transparent border arcuate from the apical angles to base, very narrow in front of the emargination. Pronotal disk very coarsely punctate, the intervals between the punctures polished and without sculpture; median impressed line deep, rather narrow, attaining the basal but not the apical margin; discal foveae not sharply defined, well separated, the anterior not longer than wide, the posterior about twice as long as wide and separated from the median and lateral impressions by distances subequal to its width; the lateral impressions rather broad, not very sharply delimited externally, the disk externally without punctures except for a few near the lateral margins.

Elytra with the sides very feebly explanate to apical third; the striae closely punctate; the intervals convex, without sculpture, slightly wider than the striae punctures.

Holotype—Summerland, B. C., November 10, 1931, (A. N. Gartrell); No. 3441 in the Canadian National Collection, Ottawa.

Paratypes—2, same data.

The species falls near *rectus* Lec. and *discretus* Lec. in Horn's table (1890, Trans. Am. Ent. Soc. XVII, 18). It is more closely allied to *insulanus* Br. The pronotum is similar in form to that of *rectus* except that the anterior margin is deeply emarginate near the angles, the sides are not straight anteriorly, and the

constriction is more abrupt, the sides behind it being parallel and the posterior angles acute. The pronotal impressions are much like those of *discretus*. In *insulanus* the anterior pronotal margin is entire, the side margins are evenly arcuate anteriorly and converging posteriorly, the posterior angles are acute, and the disk between the margins and the lateral impressions are coarsely punctate. In *insulanus* also, the form is less robust and convex, and the elytral margins are less strongly arcuate.

***Agathidium conjunctum* n. sp.**

Male. Length (extended) 3.4 mm.; width 2 mm. Broadly oval, moderately convex and contractile. Color black, the pronotal sides and the legs dark reddish-brown.

Head very finely and sparsely but distinctly punctate throughout; the frontal suture not visible; the clypeus truncate, not prolonged beyond the sides of the front, with a distinct coriaceous margin; labrum feebly emarginate; mandibles only moderately prominent, the left not prolonged. Antenna with the second segment as long as the three following, the seventh segment slightly but distinctly longer and wider than the eighth.

Pronotum very slightly less than twice as wide as long; the posterior angles right but very broadly rounded; the anterior angles slightly obtuse, broadly rounded; the disk finely and rather closely punctate, the punctures very distinct.

Elytra very slightly longer than wide, the sides broadly rounded to the apex, not at all attenuate; the humeral angle rounded, very obtuse; the sutural striae strong, attaining the basal fourth; disk rather finely and closely punctate, not at all substriate, the punctures less fine than those of the pronotum.

Mesoternum in the same plane as the metasternum; the latter without an oblique elevated ridge on each side and without a fovea and hair tuft near the middle of anterior margin, feebly alutaceous and indistinctly punctate. Abdomen alutaceous, with closely placed, hair-bearing punctures. Tibiae slender; the anterior tarsi 5-segmented, with the two basal segments distinctly dilated; middle tarsi 5-segmented, the posterior pair 4-segmented; posterior femur punctate like the abdomen; widened apically, supplied with a tooth on the lower posterior margin near apex; the tooth moderate in size, wide at base, acute at apex.

Holotype—♂, Langley, B. C., March 7, 1931, (K. Graham); No. 3399 in the Canadian National Collection, Ottawa.

The species is allied to *virile* Fall and to *revolvens* Lec. It traces to the latter in Horn's table (1880, Trans. Am. Ent. Soc. VIII, 301). In *revolvens* the elytra are substriate and elongate, and the male femora are not toothed. According to the original description of *virile*, that species has, near the middle of the front margin of the metasternum, a transversely oval fovea bearing a tuft of erect hairs and possesses a different type of puncturation on the dorsum.

***Helmis solutus* n. sp.**

Male. Length 3.6 mm.; width 1.5 mm. Elongate, subparallel, moderately convex; dorsum clothed with brownish hairs. Head, pronotum, and scutellum black, without trace of aeneous lustre; elytra yellow, each elytron with a broadly, oval black area extending from basal third to apical third and from lateral margin to the first stria; inflexed sides of pronotum, prosternum, and metasternum black; the remaining thoracic sclerites, abdomen, antennae, and legs yellow, the middle

and hind femora and the abdominal segments at middle darker.

Head finely and closely punctate; a very feeble, semicircular impressed line extending from the middle of the inner margins of the eyes to vertex. Pronotum nine-tenths as long as wide; the side margins arcuate at middle, straight and feebly converging anteriorly, scarcely sinuate before the hind angles; front angles produced, acute; disc very convex, without impressions or carinae, moderately finely and strongly punctate; the punctures separated by more than their own diameters at middle, dense near the side margins.

Elytra parallel in basal three-fifths, the sides oblique and straight apically; elytral striae feebly impressed, closely punctate; the punctures moderately coarse near the suture, becoming coarser on the sides; intervals not convex, without evident punctures.

Prosternum moderately finely, very closely punctate; the punctures of the metasternum similar but sparse; abdomen moderately closely punctate, the punctures of the apical segment finer and very close. Dense pubescence of the abdomen confined to the sides; the large parallel median area clothed like the dorsum, the apical segment with the hair close, this median area including the median third of the basal segment and all of the apical segment except its lateral angles.

Male characters: Antennae longer than the pronotum, the tenth segment attaining the posterior pronotal angle.

Female. Length 4 mm. Antennae and pronotum equal in length, the apical antennal segment not attaining the posterior pronotal angle.

Holotype—♂, Wynndel, B. C., July 20, 1931, (G. Stace Smith); No. 3345 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—35 ♂, 2 ♀, same data, July 18 and 19, 1930 and July 27, 1932; 1 ♀, Cypress Hills, Alta., Aug. 20, 1931, (F. S. Carr); 1 ♀, Hood Canal, Washington, July 24, 1928, (F. S. Carr).

The male paratypes measure from 3.5 to 4 mm.; the female paratypes from 4.2 and 4.6 mm. In the allotype and most of the male paratypes, the black elytral spots are joined to form an entire transverse band; in a few males the spots are more reduced than in the holotype. In several males and in both female paratypes, the black area is extended to include all of each elytron except a basal band and a circular subapical spot and in few specimens, the black area extends along the suture to base. The darkest specimens have the venter black throughout.

The present species is closely allied to *concolor* Lec. and *arizonicus* Brown but lacks the aeneous lustre of these allies. All examples of *solutus* are much more strongly maculate than the known examples of the allied species.

BOOK NOTICES

In Days Agone. Notes on the Fauna and Flora of Subtropical Florida in the Days When Most of Its Area was a Primeval Wilderness. By W. S. Blatchley. 338 pages, several plates. The Nature Publishing Company, Indianapolis, 1932.

The volume is written in diary form and contains an account of the ex-

periences and observations of the author as a roving naturalist in southern Florida from 1911 to 1922 during the winter seasons. It includes notes on the distribution and habits of many forms of plant and animal life and describes the changes that took place in many sections of the region during the period considered. The author describes the methods of collecting insects which he employed and notes the exact type locality and mode of occurrence of a number of the species which he described from the region. The volume is supplied with an index. It will be of considerable interest to those concerned with the natural history of the region.—W. J. Brown.

Medical Entomology, by Robert Matheson, Ph.D., Professor of Entomology, New York State College of Agriculture, Cornell University; Charles C. Thomas, Publishers, Springfield, Illinois, and Baltimore, Maryland. Price \$5.00 postpaid.

This volume of 488 pages with 211 figures deals in a clear, orderly manner the relation of insects and arthropods to practically all human diseases known to be transmitted or caused by them. In many cases the methods of control for the insects are given but no attempt is made to discuss the treatment of the diseases.

The volume is divided into 20 chapters after each of which a useful bibliography is given. The first chapter consists of a brief historical review of the subject and a list of references including the more important journals and books. The last chapter discusses methods of collecting, preserving and pinning insects.

Chapters 2, 3, and 4 deal with arthropods other than insects under such headings as Their Characteristics, Crustacea and Human Disease, and, the Acarina, Their Habits, Anatomy, Classification, and Relation to Disease. Chapter 19 is devoted to a discussion of some poisonous and urticating arthropods.

Chapter 5 treats insects in a general way, serving as an introduction to the next thirteen chapters which deal with the more important groups of insects in relation to various human diseases. Of these chapters 6 and 7 deal with the bugs and lice respectively, and chapter 18 with the fleas. Chapter 8 consists of a general discussion of the Diptera or flies which are discussed in detail in chapter 9 dealing with the mothflies or sandflies, chapters 10, 11, and 12 with the mosquitoes, 13, 14, and 15 with other blood-sucking flies, 16 with the housefly, and chapter 17 with human myiasis and allied conditions.

This book should be welcomed not only by students and teachers of medical entomology but also by physicians, public health workers and others interested in the subject.—R. Ozburn.

Mailed Saturday, February 25th, 1933.

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